

# HAWC Spectral Passbands

*SOFIA*

Wavelength range: **50 - 240  $\mu\text{m}$**

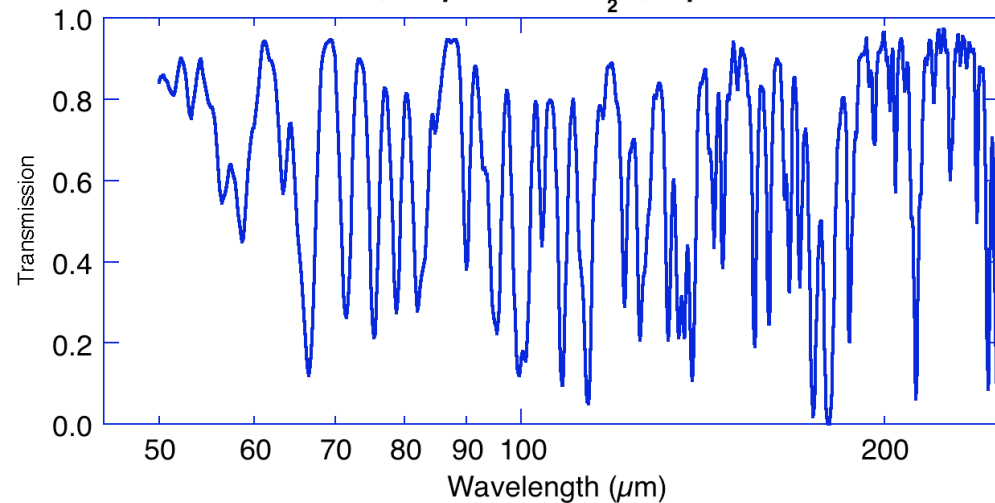
Four bandpass filters:

Band No.	$\lambda_o$	$R = \lambda_o / \Delta\lambda$
1:	53 $\mu\text{m}$	10
2:	88 $\mu\text{m}$	10
3:	155 $\mu\text{m}$	6.7
4:	215 $\mu\text{m}$	5

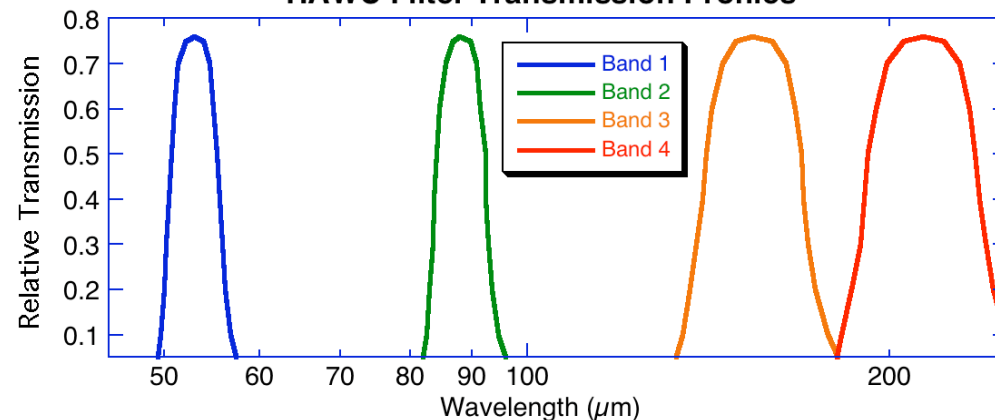
Each passband is observed separately;  
time to change passbands is roughly  
2 minutes.

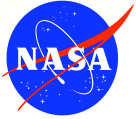
Reimaging optics provide a match to the  
diffraction limit in each passband  
(details provided on page 3).

Atmosphere transmission at 41,000 ft.,  
40° elevation, 7.3  $\mu\text{m}$  zenith  $\text{H}_2\text{O}$ , 1  $\mu\text{m}$  resolution



HAWC Filter Transmission Profiles





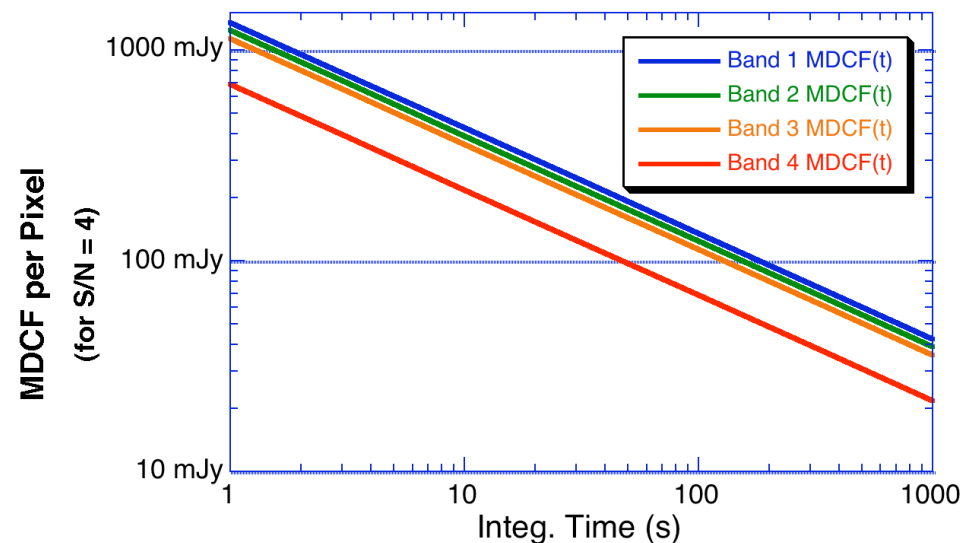
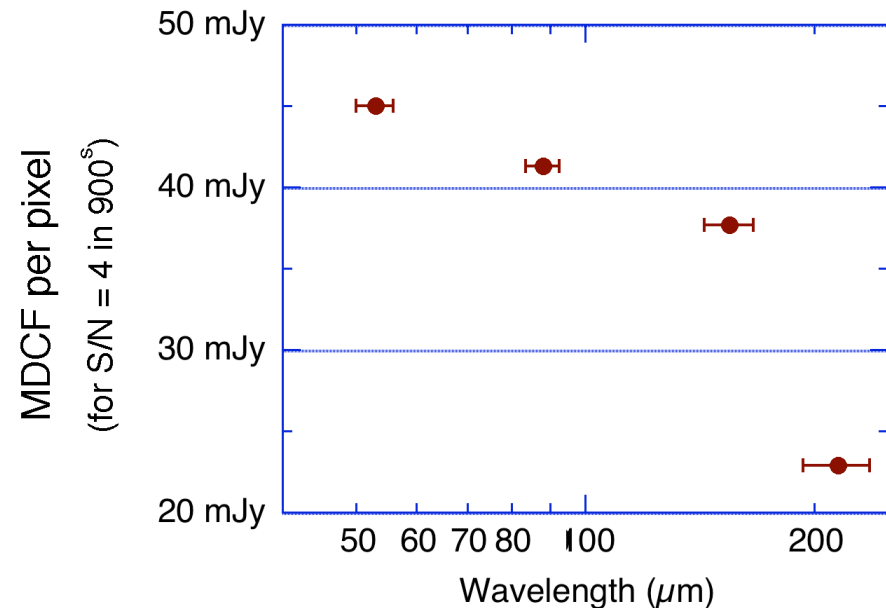
Sensitivity *per HAWC pixel* is shown for an extended continuum source, for each of the four filter bandpasses.

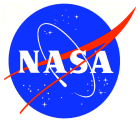
The Minimum Detectable Continuum Flux (MDCF) (mJy) necessary for  $S/N = 4$  per pixel in 900 seconds is plotted versus wavelength, for each of the four filter passbands. Horizontal error bars indicate the filters' passband FWHM in wavelength.

MDCF scales roughly as  $(S/N) / \sqrt{t}$  where  $t$  = net integration time. This is illustrated in the second graph, showing MDCF for  $S/N = 4$  vs. integration time, for the four filter passbands.

Calibration and setup overhead is roughly 10%.

Atmospheric transmission will affect sensitivity, depending on water vapor overburden.





# HAWC Angular Resolution

*SOFIA*

Beam size shown is the instrument FWHM size for nominal operating conditions. Note that there are 2.7 pixels per Airy FWHM in each of the four passbands.

Format: 12 x 32 pixel array

2.25" pixel: ■

$\lambda$  53  $\mu\text{m}$

FOV: 27" x 72"

3.5" pixel: ■

$\lambda$  88  $\mu\text{m}$

FOV: 42" x 112"

6.0" pixel: ■

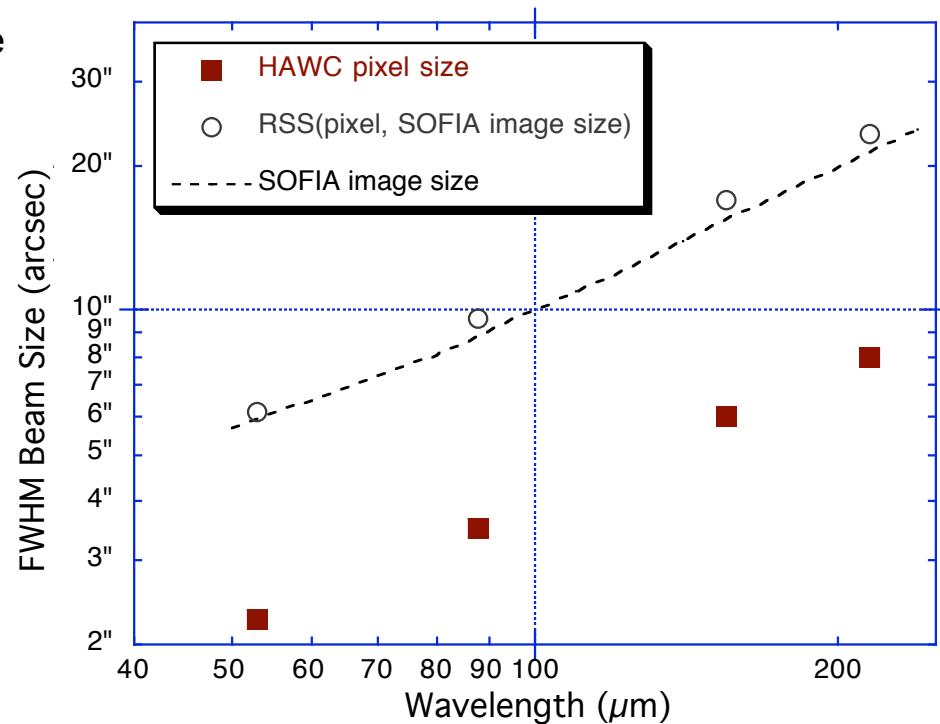
$\lambda$  155  $\mu\text{m}$

FOV: 72" x 192"

8.0" pixel: ■

$\lambda$  215  $\mu\text{m}$

FOV: 96" x 256"



Notes:

Final images from HAWC with angular resolution equal to the SOFIA telescope image size (diffraction limited for bands 2-4) should be possible with use of appropriate observing techniques and post-flight analysis.

SOFIA and all first light focal-plane instruments are now in development. All sensitivity and resolution data are preliminary, and based on anticipated performance of the observatory and the instruments. Actual performance of the SOFIA telescope and instrument combination will be established after flight operations begin. Telescope performance is expected to be upgraded during the first two years, and instrument performance may be upgraded, or additional modes or capabilities may be added.

PERFORMANCE ESTIMATES GIVEN HERE ARE BASED ON DATA SUPPLIED BY THE INSTRUMENT TEAMS. A POINT OF CONTACT FOR EACH INSTRUMENT IS PROVIDED.